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### Case Report: What's That Smell? Olfactory Seizures

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# Case Report: What's that smell? Olfactory Seizures

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## Abstract:

We report a case of a 64-year-old male who presented with transient episodes of near syncope followed by a noxious odor and was diagnosed with olfactory seizures. The differential diagnosis for near syncope is broad. This case demonstrates that unusual olfactory symptoms can lead to a diagnosis of seizure disorder in the emergency department.

## Case Presentation:

A 64-year-old male presented to the emergency department (ED) with a complaint of episodes of near syncope. He experienced two episodes the day prior to presentation, one while standing and the other while driving. These episodes lasted only a few seconds and were associated with a rotten odor after the episode. He was asymptomatic at the time of presentation. He denied any loss of consciousness, falls, or headaches with these episodes. Over the past year he had had 5-10 similar episodes, but infrequently and never twice in the same day. He had a history of vertigo five years prior. There was no history of seizures or malignancies.

The patient's vital signs were as follows: heart rate 65 beats per minute, respiratory rate 16 breaths per minute, blood pressure 161/81 mmHg, and a temperature 36.3 degrees C. The physical exam was without focal neurologic deficits. His international normalized ratio was elevated at 1.21 and his prothrombin time was elevated at 13.6 seconds. His blood counts, electrolytes, renal function were within the normal ranges. His electrocardiogram demonstrated sinus bradycardia at a rate of 59, with normal intervals, and no acute ischemic changes. The ED computerized tomography (CT) scan of the head did not show an acute intracranial abnormality. Atrophy and likely sequela of chronic microvascular ischemia were noted. The patient was seen and evaluated in the ED by the neurologic service and the patient was started on an antiepileptic medication. He was admitted to the hospital, under the medical service. A routine electroencephalogram (EEG) was performed and did not show any seizures. A magnetic resonance imaging of the brain (MRI) with and without gadolinium contrast showed no acute infarction, intracranial hemorrhage, or mass effect. There were scattered hyperintensities seen in the cerebral white matter with a single focus within the left corpus callosum, a nonspecific finding and was favored to represent chronic microangiopathy. The patient was discharged two days after admission in stable condition with follow-up with neurology. Discharge medications included levetiracetam.

## Discussion:

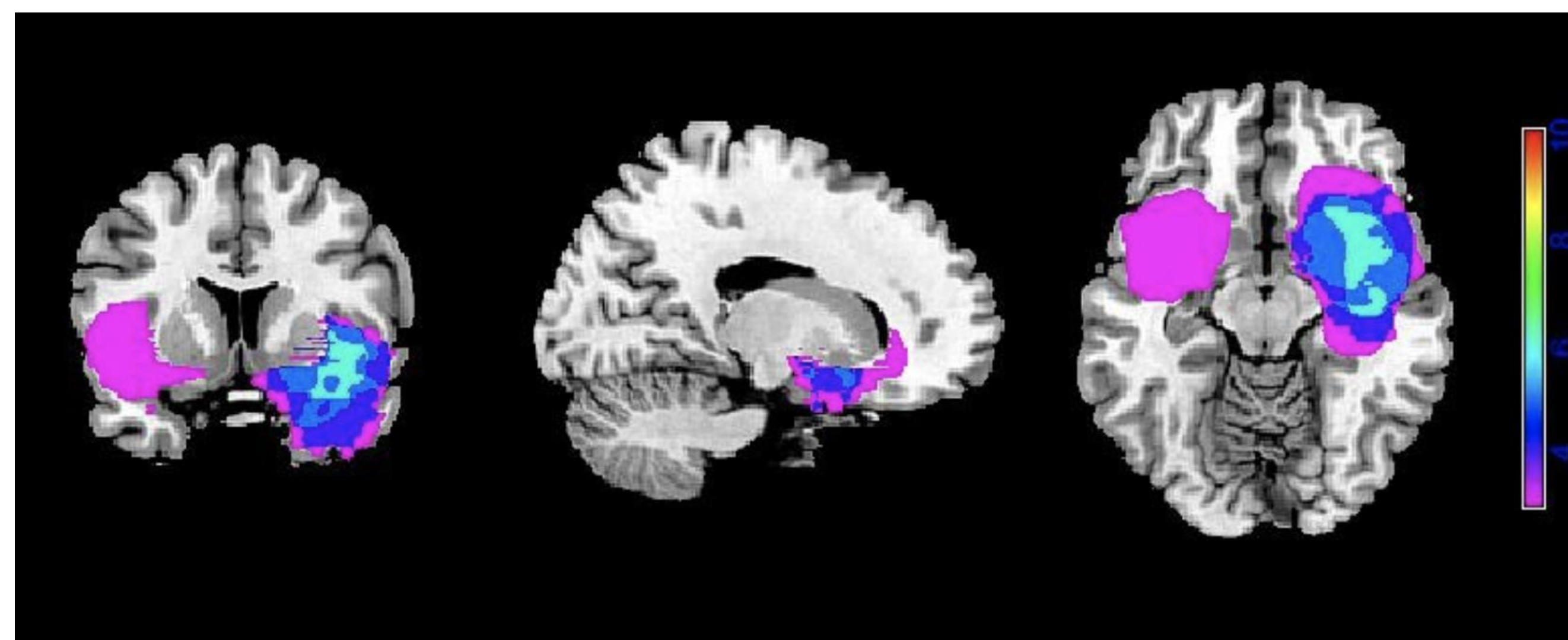
The patient presented with transient alteration in consciousness and the perception of a noxious odor and was found to have olfactory seizures.

### Incidence of olfactory auras:

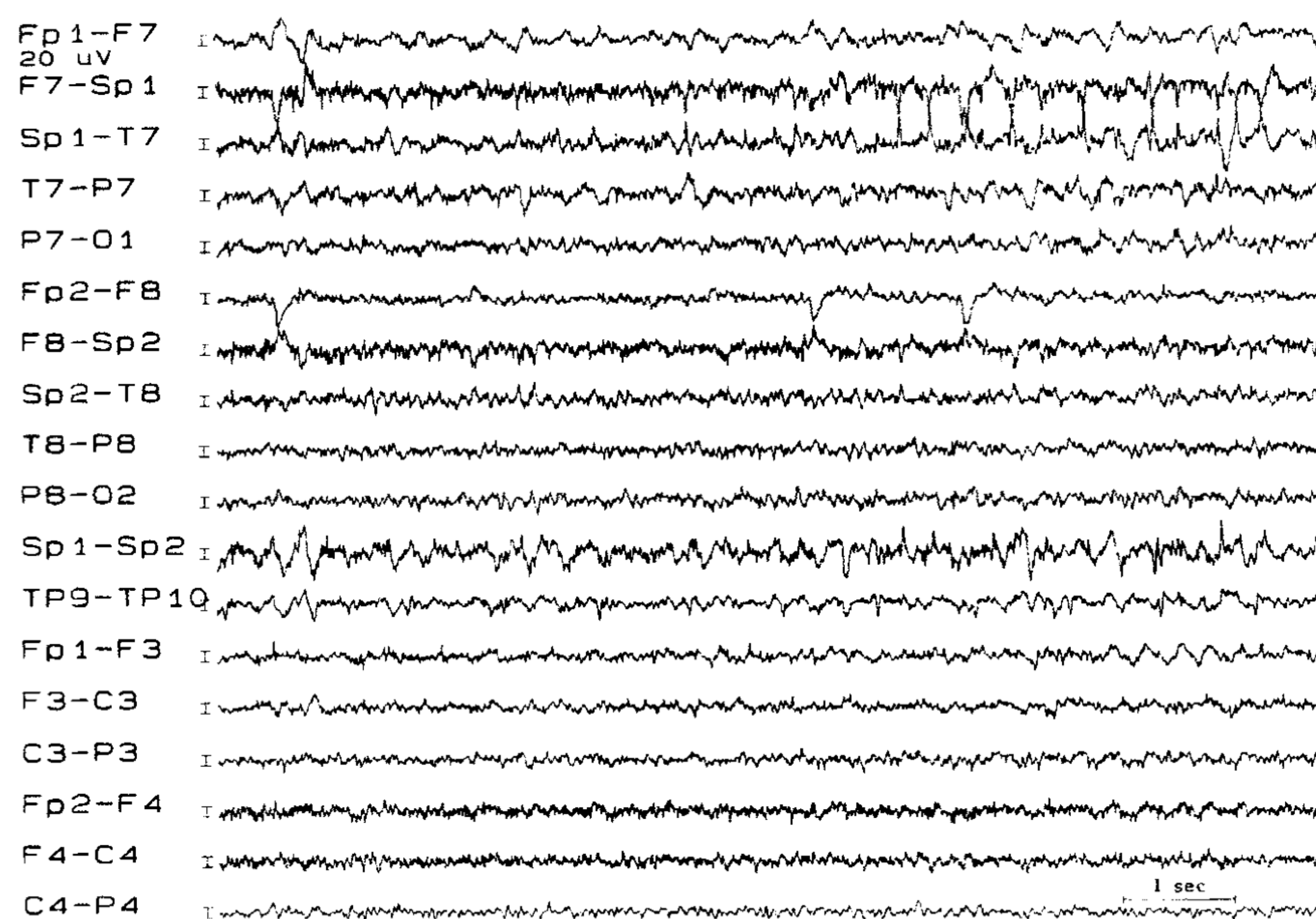
It is relatively common for seizures to cause transient alterations in level of consciousness, approximately 36% of patients with epilepsy have focal impaired awareness seizures [Kumar]. However the incidence of olfactory auras is much lower, with estimates that only 0.9% of all auras are olfactory in nature [Acharya]. In patients with temporal lobe epilepsy (TLE) the incidence of olfactory auras rises to around 5.5% [Chen].

### Pathophysiology:

The pathophysiology of seizures is due to excessive discharge of neurons due to electrical dysfunction. There is also evidence that brain network dysfunctions can also be involved in epilepsy [Meixia]. Types of seizures are delineated by where the electrical discharge originates, and TLE is one subset of epilepsy that is known to have not only olfactory dysfunction [Motoki] but also olfactory auras [Chen]. It is also postulated that some olfactory seizures may generate from the olfactory bulb [Sarnat]. There has been some evidence from studies of in vitro guinea pig brains that demonstrates seizure patterns may originate in the olfactory bulb, causing seizure like activity through a different mechanism than temporal lobe seizures [Uva].



**Figure 1:** MRI lesion overlay of patients with olfactory auras [Adapted from Florean et al. 2024]



**Figure 2:** Ictal EEG in a patient with repetitive spikes at the left sphenoidal electrodes (SP1) during an olfactory aura [Adapted from Acharya et al. 1998]

## References:

Available on request

## Discussion continued:

### Presentation of olfactory seizures:

Seizures can present in a variety of different ways. Generalized tonic-clonic seizures are usually obvious, however complex focal seizures can be more subtle. In addition, many patients with seizures are asymptomatic between episodes, as was our patient. In cases involving olfactory auras, the change in olfactory sensation may be the main factor that differentiates from other etiologies of near syncope. It is noted that patients who experience olfactory auras are more likely to experience other auras as well, rather than isolated olfactory auras [Chen]. In addition to seizures, the differential diagnosis for auras includes “vestibular dysfunction, migraine, stroke, autonomic disturbances, drug intoxications and psychiatric disorders”. [Fernández-Torre]

### Laboratory studies:

In cases of near syncope and suspected seizure it is important to access for other causes such as anemia, hypoglycemia, electrolyte derangements, and acute coronary syndrome. Abnormal electrolytes such as hyponatremia, hypomagnesemia, and hypocalcemia can also precipitate seizures [Nardone]. Immediately after a convulsive seizure the lactate may be elevated [Matz], however when there is a delay between the seizure like activity and the lab draw, these tests may be normal. In our case a lactate was not obtained as the patient was not immediately post convulsive seizure.

### Imaging:

Many primary brain tumors first present with seizures [Lee], so it is always important to evaluate for intracranial masses with any case of new onset seizures. In cases of patients with olfactory auras and a mass is located, mesial temporal lobe tumors are the most common location [Acharya, Florean]. EEG is the best procedure to evaluate for seizures, but if the seizure like activity does not occur while the patient is hooked up to electrodes there may be a normal EEG report in a similar way to how electrocardiograms can miss arrhythmias if they are not present during the exam. In patients with olfactory auras the most common location to have EEG abnormalities is in the mesial temporal lobe [Acharya, Florean].

### Management:

Medical management consists of antiepileptic medications such as Levetiracetam to prevent seizures, as was used in our patient. Benzodiazepines can also be used to terminate a seizure. Our patient did not have any seizure like episodes, while being carefully observed by the medical service.

### Surgical treatment:

Tumors are the most common etiology of olfactory auras [Acharya]. In patients with tumor related epilepsy and olfactory auras, the most common location for tumors appears to be in the anterior and mesial temporal lobe [Acharya, Florean]. When a mass is identified and thought to be the etiology of seizures surgical management is often curative, however some patients will continue to have seizures [Chen, Florean] and may continue to require multiple antiepileptic medications.

## Conclusions:

The differential diagnosis of near syncope is broad, and other etiologies of transient alterations in level of consciousness may need to be excluded prior to the presumption of seizures in the absence of seizure like activity. However atypical features such as isolated olfactory auras can help tailor a workup towards the diagnosis of seizures in the emergency department.